

## Session 31 : Isotopes stables en écologie : de la cellule à la biosphère

### P31/01 Titre : *Mirounga leonina* (Kerguelen) : appréhender son écologie à partir des isotopes stables du carbone et de l'azote de la dentine des canines

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The ontogeny of foraging behaviour: change in distribution and trophic levels through life can be investigated by measuring of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  stable isotopes for each layers deposited in a growing tooth. Here, we present, for the first time, a longitudinal description of the ontogeny of foraging behaviour and the niche partitioning process according to sex and age of a highly sexually dimorphic species: the Southern Elephant Seal (*Mirounga leonina*). The  $\delta^{13}\text{C}$  signature revealed that, up to the age of 4, both males and females were mainly foraging in subantarctic waters, although over a broad range of marine habitats. Then, two patterns emerged for males: males were becoming faithful to a foraging habitat, either in Subantarctic ( $-17\text{‰}$ ) or in Antarctic waters ( $-20\text{‰}$ ) as suggested by a reduced intra-individual variation in  $\delta^{13}\text{C}$ . Up to the age of 4, juvenile males had a slightly higher trophic level than juvenile females but by the age of 3-4, males exhibited a progressive increase in trophic concomitant with an increased fidelity to a foraging habitat. Thus, juvenile males have a broader feeding niche than females, and males exhibit a significant shift in their foraging strategy with age, thereby revealing an asymmetric foraging strategy between the two sexes.

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### P31/02 Titre : Exploring carbon allocation patterns using natural carbon isotope abundance in oil palm in a North Sumatra environment

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Oil palm trees (*Elaeis guineensis* Jacq), that are of substantial economical importance, produce oil in fruits bunches of more than 50 kilograms. Such an amount of organic material implies large carbon fluxes to reproductive tissues and high integrated leaf  $\text{CO}_2$  assimilation to sustain lipid production. Here, we use  $^{12}\text{C}/^{13}\text{C}$  isotopes as natural tracers to identify the origin of carbon atoms remobilized to produce fruit tissues until maturation. In fact, the carbon used for reproductive development may originate from trunk, roots (storage) or leaves. Therefore, in order to understand the patterns of carbon fluxes between autotrophic sources (leaves) and heterotrophic organs (fruits) within oil palm trees, the natural carbon isotope composition ( $\delta^{13}\text{C}$ ) of total organic matter (TOM) and soluble sugars as well as lipids and starch from samples collected in the field (in Sumatra) was investigated. The sampling was carried out on leaves (leaflets, petioles and rachis) at different ages, trunks (along height), roots and fruits at different maturation stages. Floral buds, spikelets and peduncle were sampled too. Our first results on leaves reveal significant difference in  $\delta^{13}\text{C}$  of TOM between young, heterotrophic leaves (leaf rank from  $-6$  to  $0$ ), mature leaves (from rank  $1$ , which is the first stage of leaf autotrophy) and old leaves (above rank  $8$ ): young leaves are significantly  $^{13}\text{C}$ -enriched compared to older, autotrophic leaves. There is a gradient of  $\delta^{13}\text{C}$  of TOM between leaflets ( $-29.0\text{‰}$ ), rachis ( $-28.2\text{‰}$ ) and petioles ( $-27.9\text{‰}$ ). Heterotrophic organs are  $^{13}\text{C}$ -enriched, with a  $\delta^{13}\text{C}$  value around  $-27\text{‰}$  (trunk meristem:  $-27.0\text{‰}$ ; Roots: from  $-27.2$  to  $-26.7\text{‰}$ ; Terminal bud:  $-27.2\text{‰}$ ; Stall:  $-27.3\text{‰}$ ; Spikelet:  $-26.5\text{‰}$ ; Floral bud before blooming:  $-27.6\text{‰}$ ). Such enrichment has also been found in other plants while poorly explained. Fruit organic matter appears progressively depleted as maturation proceeds, from  $-26.9\text{‰}$  after 2 months to  $-28.8\text{‰}$  six months after pollination. This effect is related to the conversion of sugars to lipids (oleosynthesis), which are known to be strongly  $^{13}\text{C}$ -depleted as compared to other metabolites. Still, our results suggest that the  $\delta^{13}\text{C}$  value at the beginning of fruit development is enriched compared to leaf-assimilated carbon, indicating that unless particular isotopic fractionations occur, carbon remobilization from other organs such as roots and trunk sustain fruit initiation. Our current analyses focus on compound-specific isotopic analyses (starch, soluble sugar, lipids) so as to better characterize isotopic fractionations and draw hypotheses on tree-level carbon trafficking pathways between photosynthetic assimilates, carbon reserve pools and fruit/oil carbon.

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